VAST 2006 Contest Second Place, Corporate Category
DECIDE - SSS Research, Inc.

Russell A. Lankenau* M. Andrew Eick† Alexander Decherd‡ Maxim Khailo§ Phil Paris¶
Jesse Fugitt‖

SSS Research, Inc.

ABSTRACT

Summary of SSS Research, Inc.'s contest entry in the VAST 2006 Contest. SSS Research performed an analaysis of the supplied data set with DECIDE, a tool for evidence management, structured argumentation, and hypothesis visualization and scoring.

Keywords: Visualization, Structured argumentation,

Index Terms: H.5.2 [Information Interfaces and Presentations]: User Interfaces—Graphical User Interfaces (GUI); I.3.6 [Computer Graphics]: Methodology and Techniques—Interaction Techniques

1 INTRODUCTION

DECIDE is a hypothesis visualization tool designed to assist analysts in generating and manipulating hypotheses through structured argumentation, analysis of competing hypotheses, Bayesian scoring, and multiple evidence marshalling techniques. DECIDE enables analysts to construct arguments, associate evidence with hypotheses and sub-hypotheses, evaluate and parameterize evidence credibility and relevance, and score arguments. DECIDE incorporates concepts from structured argumentation, judicial proof, analysis of competing hypotheses, and evidence marshalling, and uses information visualization to provide an environment for building, manipulating, analyzing, and understanding complex intelligence arguments. DECIDE is a commercial product developed by SSS Research, Inc. For more information about DECIDE and SSS Research, visit http://www.sss-reseach.com. FreeMind is a mind-mapping tool, freely available for Windows, Mac, and Linux from http://freemind.sourceforge.net.

2 ANALYSIS STRATEGY

We attempted to perform a thorough analysis of the data set by working from general questions about the content of the data set to specific questions about individual events, actors, and relationships.

2.1 Data Set Exploration

Our main tool in exploring the data set was Windows Desktop Search. DECIDE provides an interface to Desktop Search that allowed us to easily create evidence items from source documents. We also used FreeMind as an organizational aid in the initial stages of our investigation. By capturing basic ideas in FreeMind, we were able to map out the structure of the data to aid in further investigation without cluttering up DECIDE's evidence collection with basic facts.

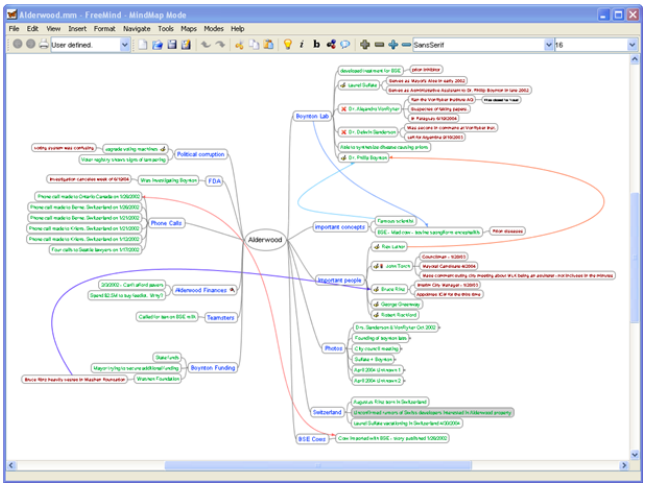

Figure 1: Mindmap illustrating dataset structure.

Once our initial data-gathering was complete, we used DECIDE's evidence marshalling capabilities to identify items of evidence that appeared to be connected. Figure 2 shows a comparison of evidence by event date. The highlighted region shows a period of high activity. We were able to identify several key evidence items within the data set, including evidence of tampering in the Alderwood voter registry, financial connections between individuals in the Alderwood city government and Boynton Labs, and connections between individuals employed by Boynton Labs and those active in Alderwood's government.

2.2 Hypothesis Construction

Once we felt we had a good picture of the content of the data set, we constructed a set of hyotheses that seemed to describe the plots that were present in Alderwood during the period described. These hypotheses described political corruption present in the Alderwood city government, ethical issues within Boynton Labs, and connections between Boynton Labs and Alderwood city officials. Alternate hypotheses were provided for all major subhypotheses to provide structure for additional intelligence collection tasking. Figure 3 shows the final set of hypothesis graphs, including possible alternate hypotheses.

2.3 Hypothesis Evaluation

DECIDE performs Analysis of Competing Hypotheses [1] and can also score multiple hypotheses using a Bayesian belief network. By using this function, we were able to evaluate our hypotheses for plausibility. Most of the evidence available to us supported our

*e-mail:russell.lankenau@sss-research.com
†e-mail:aeick@sss-research.com
‡e-mail:alex.decherd@sss-research.com
§e-mail:maxim.khailo@sss-research.com
¶e-mail:phil.paris@sss-research.com
‖e-mail:jesse.fugitt@sss-research.com

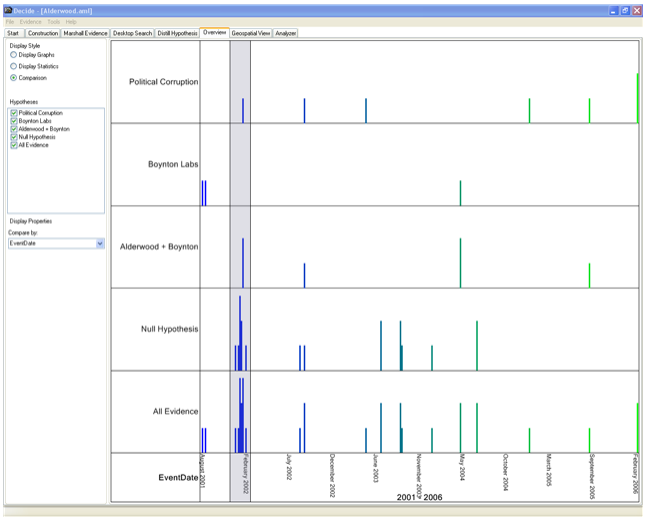

Figure 2: Overview screen in DECIDE, showing a cluster of events.

hypotheses, due to the fact that our hypotheses were constructed to fit the data we had, rather than the other way around. As a result of this, our hypotheses were assigned fairly high scores. Evidence resulting from investigation of the alternate hypotheses developed during our analysis could conceivably cause the scores to change, if additional evidence were uncovered which could refute one of our hypotheses.

3 Strengths and Weaknesses

3.1 Strengths

As a collection system for evidence and a tool for evaluating competing hypotheses, DECIDE performed extremely well. The Desktop Search integration was extremely helpful, and the various evidence marshalling techniques available were an extremely powerful tool for quickly evaluating the evidence collection as a whole.

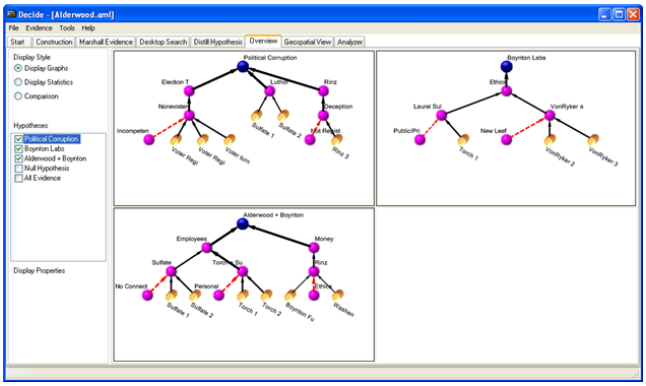

Figure 3: Overview screen in DECIDE, showing structure of hypothesis graphs.

The freeform structure for argument creation was useful as well, because alternate hypotheses could be included in each hypothesis without much additional effort. On teh whole, our analysis strategy seemed sound. There may have been additional facets to the data set that our general search technique failed to reveal, but we feel that we identified the major plots fairly successfully.

3.2 Weaknesses

DECIDE is a product under development, and as such, there are quite a few areas where we feel it could be improved. The desktop search integration worked well, but the process for creating evidence items from documents needs to be improved to automatically include more information from the source document. The biggest stumbling block was dealing with the sheer volume of information available. The analysis required a large time commitment, and DECIDE did not provide enough in the way of automating the work or keeping track of documents that had already been viewed, so different searches would often return the same documents without notifying the user of repeated results. Some type of automated entity extraction and link analysis would have been incredibly helpful in the initial exploration of the data set, as would a method of tracking occurance of search terms across the entire data set.

3.3 Overall Impressions

We believe that DECIDE performed very well. This contest was an excellent test of its capabilities, and pointed out several areas where it could be improved.

Acknowledgements

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References

[1] R. J. Heuer, Jr. *Psychology of Intelligence Analysis*. Central Intelligence Agency Center for the Study of Intelligence, 1999.